

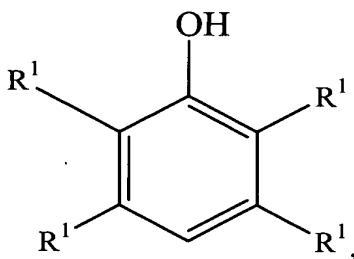
## CLAIMS:

1. A process for preparing a benzoquinone compound, said process comprising:

oxidizing an aromatic hydroxy compound in a solvent with an oxygen gas or an oxygen-containing gas mixture in the presence of a catalytic amount of a copper containing catalyst and a promoter to form the benzoquinone compound, wherein said copper containing catalyst comprises a mixture of a halide salt and a copper salt, or a double salt of the halide salt and the copper salt, and wherein the catalytic amount of the a copper containing catalyst less than or equal to 0.1 mole per mole of aromatic hydroxy compound.

2. The process of Claim 1, further comprising reducing said benzoquinone compound with a reducing agent to provide a hydroquinone compound.

3. The process of Claim 1, wherein said aromatic hydroxy compound has a formula:



wherein R<sup>1</sup> is independently selected from the group consisting of a hydrogen and a hydrocarbyl group

4. The process of Claim 1, wherein said aromatic hydroxy compound is selected from the group consisting of phenol, 2,6-dimethyl phenol, 2,6-di-tertiary-butyl phenol, 2-tertiary-butyl phenol, alpha-naphthol, meta-cresol, ortho-cresol, ortho-phenylphenol, ortho-benzylphenol, 2,3,6-trimethyl phenol, ortho-vinylphenol, 2-sopropylphenol, 2,6-diisopropylphenol, 2,3,5,6-tetramethylphenol, 2,3,5-trimethylphenol, and mixtures of the foregoing aromatic hydroxy compounds.

5. The process of Claim 1, wherein said aromatic hydroxy compound is ortho-cresol.

6. The process of Claim 1, wherein said oxygen-containing gas mixture comprises nitrogen, ambient air, helium, or argon.

7. The process of Claim 1, wherein said halide salt is of the formula, M-X; wherein M comprises an alkali metal, an ammonium ion, or an organoammonium ion; and X is selected from the group consisting of chloride, bromide, and iodide.

8. The process of Claim 7, wherein said organoammonium ion is of the formula,  $R^2-[NH_3]^+$ , wherein  $R^2$  is a monovalent hydrocarbyl group containing 1 to about 6 carbon atoms.

9. The process of Claim 1, wherein said copper salt comprises a cuprous salt, a cupric salt, or mixtures of the foregoing copper salts.

10. The process of Claim 1, wherein said copper salt is selected from the group consisting of cuprous chloride, cuprous bromide, cuprous iodide, cupric chloride, cupric bromide, cupric iodide, cuprous acetate, and cupric acetate.

11. The process of Claim 1, wherein said double salt of said halide salt and said copper salt comprises a compound of the formula,  $M[CuX_3]$ , or a compound of the formula,  $M_2[CuX_4]$ ; wherein M is selected from the group consisting of an alkali metal, an ammonium ion, and an organoammonium ion; and X is selected from the group consisting of chloride, bromide, and iodide.

12. The process of Claim 1, wherein said double salt of said halide salt and said copper salt is at least one selected from the group consisting of lithium trichlorocuprate dihydrate, ammonium trichlorocuprate dihydrate, diammonium tetrachlorocuprate dihydrate, dipotassium tetrachlorocuprate dihydrate, cesium trichlorocuprate dihydrate, dicesium tetrachlorocuprate dihydrate, dilithium tetrabromocuprate hexahydrate, potassium tribromocuprate, diammonium tetrabromocuprate dihydrate, and cesium tribromocuprate.

13. The process of Claim 1, wherein said double salt of said halide salt and said copper salt is lithium trichlorocuprate dihydrate.

14. The process of Claim 1, wherein oxidizing said aromatic hydroxy compound is carried out at a pH from 1 to about 5

15. The process of Claim 1, further comprising adjusting a pH during oxidation to maintain said pH at about 1 to about 5.

16. The process of Claim 1, further comprising adding an acid and maintaining a pH at about 1 to about 5.

17. The process of Claim 1, wherein said promoter comprises an organic amide.

18. The process of Claim 1, wherein said promoter is selected from the group consisting of N-methyl-2-pyrrolidone, N,N-dimethylformamide, N,N-diphenylformamide, N-methyl-acetamide, N-cyclohexyl-N-methylformamide, and N-phenyl-N-methylformamide.

19. The process of Claim 1, wherein oxidizing the aromatic hydroxy compound is carried out at a temperature of about 20°C to about 75°C.

20. The process of Claim 1, wherein oxidizing the aromatic hydroxy compound is carried out under a pressure is about 17.5 Newtons per square centimeter to about 172.4 Newtons per square centimeter.

21. The process of Claim 1, wherein oxidizing the aromatic hydroxy compound is carried out in presence of a water-miscible solvent.

22. The process of Claim 1, wherein oxidizing the aromatic hydroxy compound is carried out in presence of a partially water-miscible solvent.

23. The process of Claim 22, wherein said partially water-miscible solvent comprises an organic ketone solvent containing about 4 to about 10 carbon atoms or combinations of said organic ketone solvent.

24. The process of Claim 21, wherein said water-miscible solvent comprises an organic alcohol containing 1 to about 8 carbon atoms, an organic sulfoxide containing about 2 to about 4 carbon atoms, an organic ether containing about 4 to about 12 carbon atoms, or combinations of the foregoing solvents.

25. The process of Claim 21, wherein said water-miscible solvent is selected from the group consisting of Isopropyl alcohol, octanol, dimethylsulfoxide monoglyme, and combinations of the foregoing solvents.

26. The process of Claim 22, wherein said partially water-miscible solvent is selected from the group consisting of methylisobutylketone, methylethylketone, and combinations of the foregoing solvents.

27. The process of Claim 1, wherein said promoter and aromatic hydroxy compound are present in a weight ratio from about 0.05 to about 0.7.

28. The process of Claim 2, wherein reducing said benzoquinone comprises:  
  
contacting the benzoquinone with a reducing agent comprising hydrogen gas or hydrogen-containing gas mixtures in the presence of a reducing catalyst.

29. The process of Claim 2, wherein the reducing agent is selected from the group consisting of sodium borohydride, sodium dithionate, lithium aluminum hydride, sodium hydro sulfite and sodium bisulfite.

30. The process of Claim 2, further comprising isolating the hydroquinone compound comprises:

distilling the solvent; and

precipitating said hydroquinone compound using an anti-solvent.

31. The process of Claim 30, wherein said anti-solvent is selected from the group consisting of toluene, xylene, and heptane.

32. A polycarbonate comprising structural units derived from the hydroquinone compound prepared in accordance with Claim 2.

33. A polycarbonate prepared using the hydroquinone compound prepared in accordance with Claim 2.

34. A process for preparing 2-methylhydroquinone, said process comprising:

oxidizing ortho-cresol with oxygen gas in a solvent selected from the group consisting of methylisobutylketone and methylethylketone in the presence of lithium trichlorocuprate dihydrate catalyst, and N-methylpyrrolidone promoter at a pH of about 1 to about 5 to form 2-methyl benzoquinone, wherein the lithium trichlorocuprate dihydrate catalyst is less than or equal to 0.1 mole per mole of the ortho-cresol;

reducing the 2-methyl benzoquinone; and

isolating the 2-methylhydroquinone.

35. A polycarbonate comprising structural units derived from the 2-methylhydroquinone prepared in accordance with Claim 35.

36. A polycarbonate prepared using the 2-methylhydroquinone prepared in accordance with Claim 35.

37. A process for preparing a benzoquinone compound, said process comprising:

oxidizing an aromatic hydroxy compound in a solvent with an oxygen gas or an oxygen-containing gas mixture in the presence of catalytic amount of a copper containing catalyst and a promoter to form the benzoquinone compound, wherein said promoter comprises an organic amide.

38. The process of Claim 37, wherein the catalytic amount of the copper containing catalyst is less than or equal to 0.1 mole per mole of the ortho cresol.